GLOBAL CLIMATE BULLETIN

n°223 – January 2018

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I. DESCRIPTION OF THE CLIMATE SYSTEM (November 2017)

I.1.Oceanic analysis

Over the Pacific ocean :

La Nina phenomenon is now well in place

- Along the equator strong increase of negative anomaly on the main East part of the railway. Niño 3.4 index : -0.8℃. Still a strong West-East gradient, with weak positive anomaly West of the date line.
- in subsurface, increase of East-West contrast. The East cold anomaly move weakly upward and slowly Eastward, while in the west, the hot anomaly has clearly increased.
- the PDO index is slightly negative since July.

Over the Maritime Continent :

- Slightly above normal SST with a cooling trend in November.

Over the Indian Ocean :

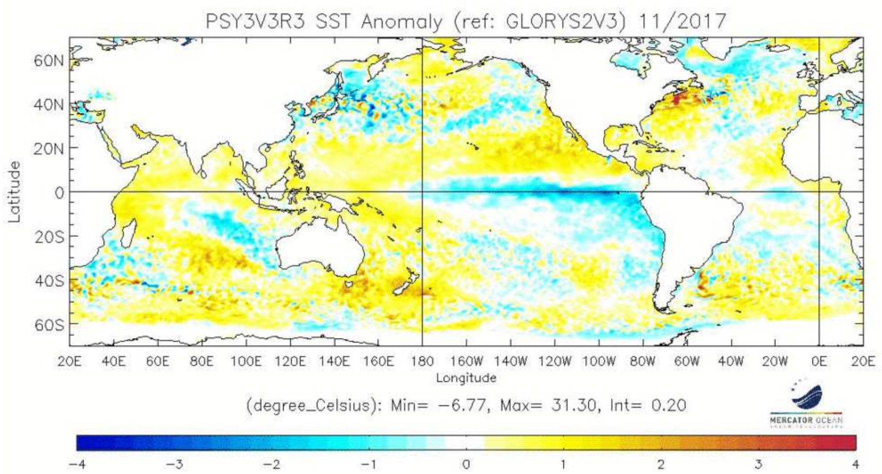
- Generalized warm anomalies, except in the South-East. Anomalies have weakened in November.
- IOD index near 0.

Over the Atlantic:

- unstructured anomalies.
- over Northern Atlantic, the "cold blob" cold anomaly is persisting while there are strong warm anomalies near American coast.

Over the Mediterranean:

- Significant cooling in November.



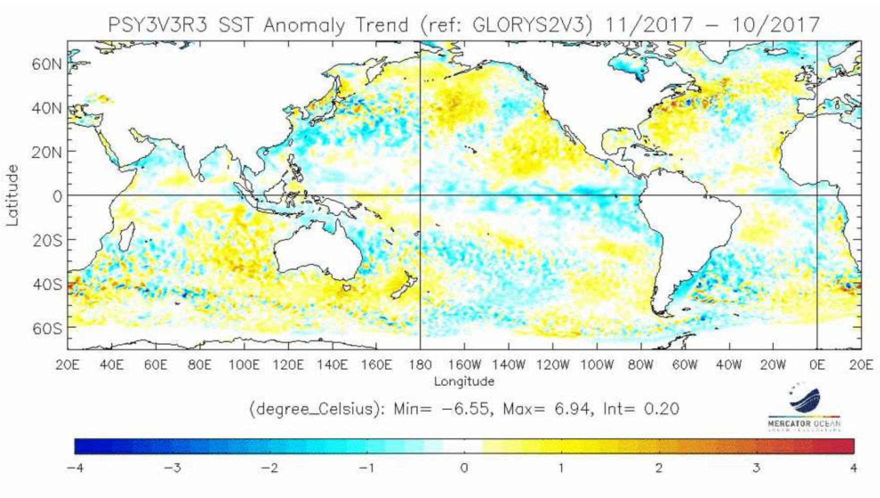


fig.I.1.1: top : SST Anomalies (℃) . Bottom : SST tendency (current – previous month), (reference Glorys 1992-2013).

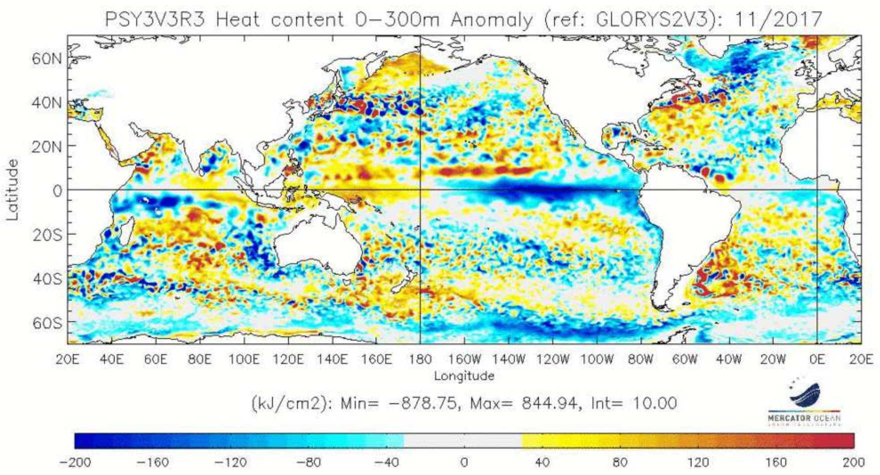


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

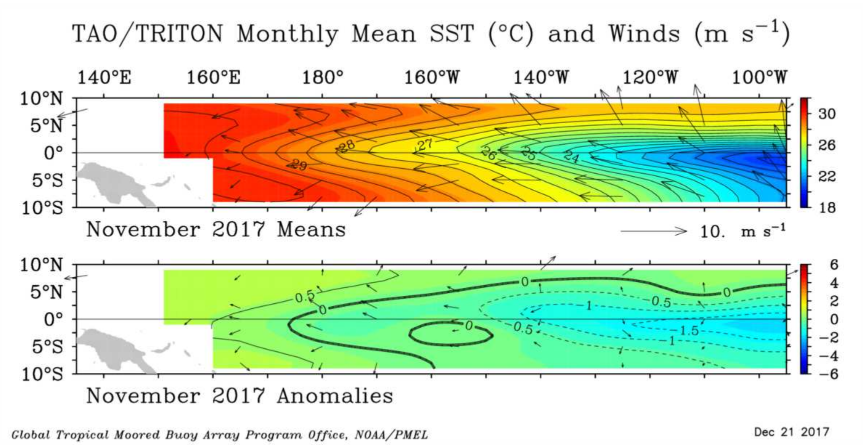


fig.I.1.3: SST Anomalies and Wind anomalies over the Equatorial Pacific from TAO/TRITON.http: //www.pmel.noaa.gov/tao/drupal/assorted_plots/images/sst_wind_mon.png

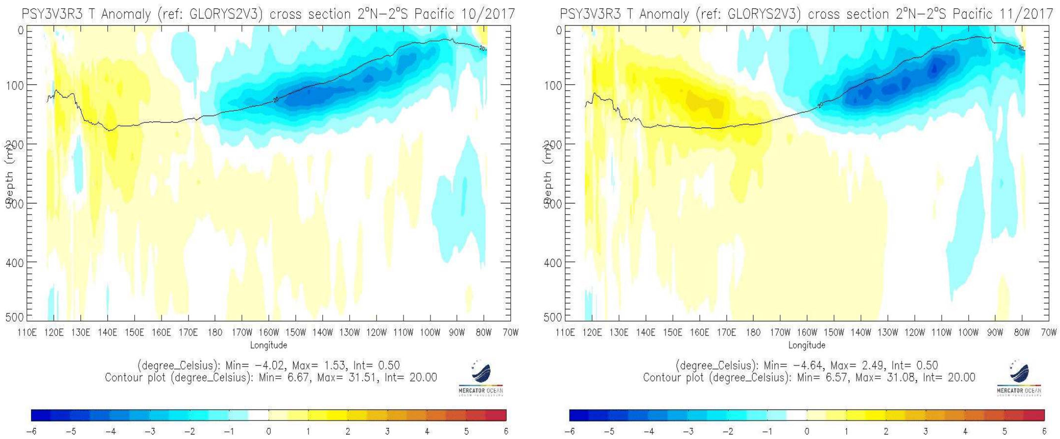


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

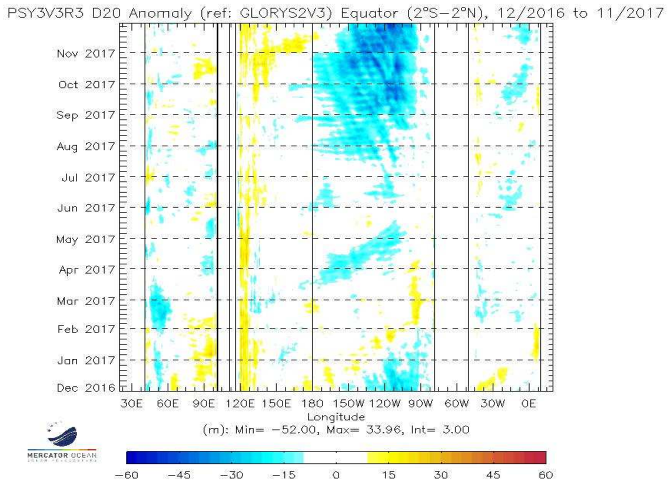


fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20℃ isotherm) along the equator for all oceanic basins over a 6 month period

Sea surface temperature near Europe :

European Arctic Sea: Still very mild north of Iceland , no significant change.

North Sea: close to normal, no significant change.

Baltic Sea: below normal to normal, negative anomalies became slightly weaker.

Cold blob south of Greenland/Iceland: still persisting, but shifted a little bit eastward reaching Ireland without much change of intensity.

Subtropical East Atlantic: Cooling close to southwest Iberia intensified, rest of subtropical East Atlantic still warm. There are some negative anomalies along the 30°N latitude.

Mediterranean: Western and eastern Mediterranean showed above normal anomalies while Central Mediterranean and in the Aegean Sea had a significant cooling, could be partly due to local events.

Black Sea: Slightly colder than normal, seasonal cooling was stronger than normal.

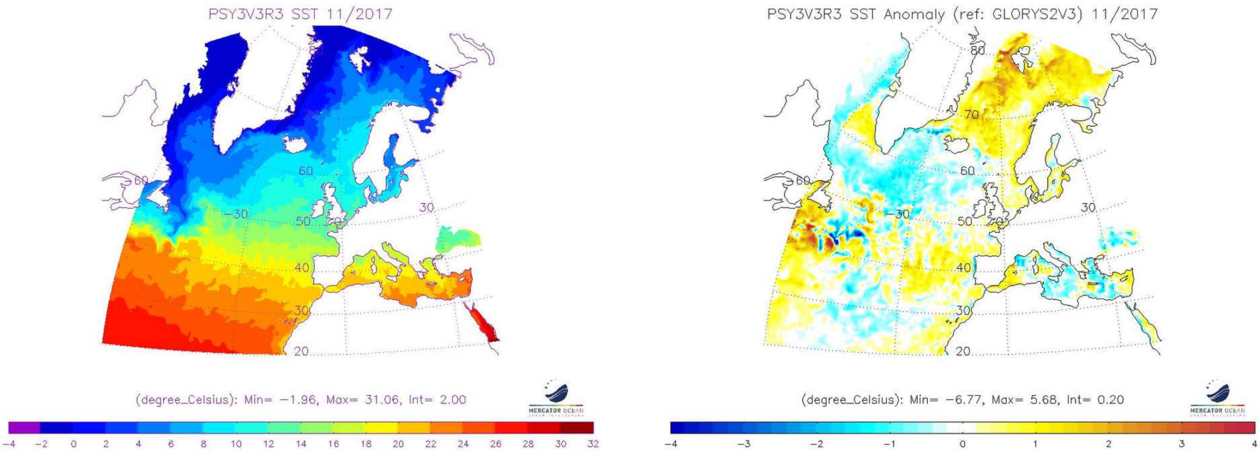


fig.I.1.6 : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys 1992-2013).

I.2. ATMOSPHERE

I.2.a General Circulation

Velocity Potential Anomaly field in the high troposphere (fig. 1.2.1. a – insight into Hadley-Walker circulation anomalies) :

In November there was two big areas in the tropical belt.

- a downward motion area over Pacific, America and Atlantic Ocean, with a main kernel over Atlantic.
- an upward motion area over Africa, Indian Ocean and Maritime continent, with a maximum over maritime continent and a local minimum in the South-of Indian Ocean linked with the cold SST anomaly.

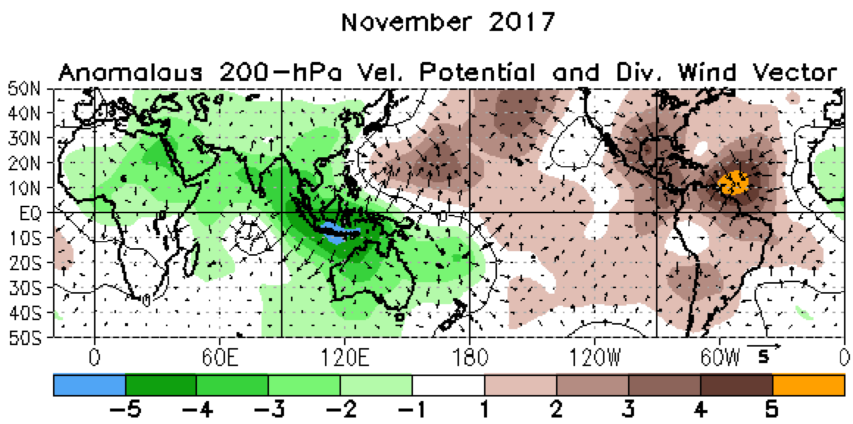


fig.I.2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

- SOI index : (+0.9). See NOAA Standardized SOI: https://www.ncdc.noaa.gov/teleconnections /enso/indicators/soi/ .
  MJO (fig. I.2.1.b)

- few activity during November.

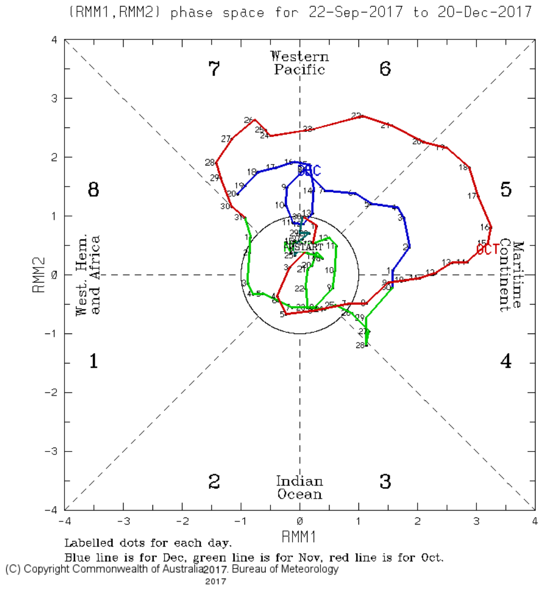


fig.I.2.1.b: indices MJO http://www.bom.gov.au/climate/mjo/

<u>Stream Function anomalies in the high troposphere</u> (fig. 1.2.2 – insight into teleconnection patterns tropically forced):

- Strong negative PNA enforce by mid-latitude phenomenons interactions
- PNA index : -2 .

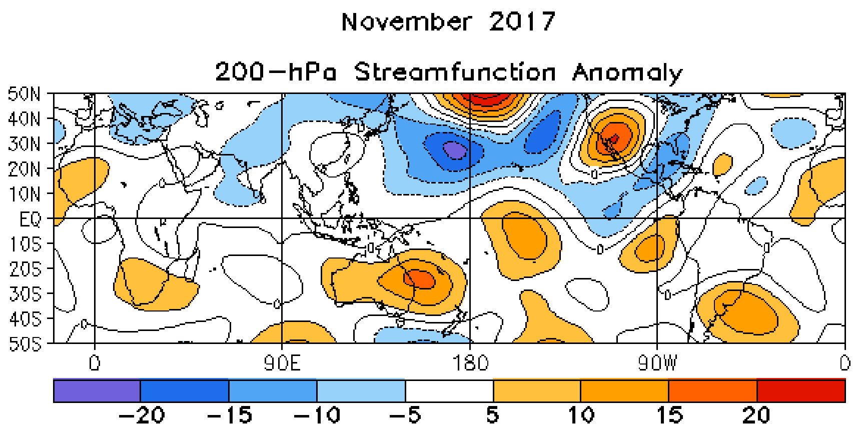


fig.I.2.2: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

<u>Geopotential height at 500 hPa</u> (fig.1.2.3 – insight into mid-latitude general circulation):

- Northern Atlantic and Europe : Positive anomaly on the Northern Atlantic Ocean and negative over Scandinavia and Mediterranean Sea.
- Pacific-America : Good projection on the negative phase of PNA. Strong positive anomaly over Gulf of Alaska, negative anomaly over Canada and positive over the United States.

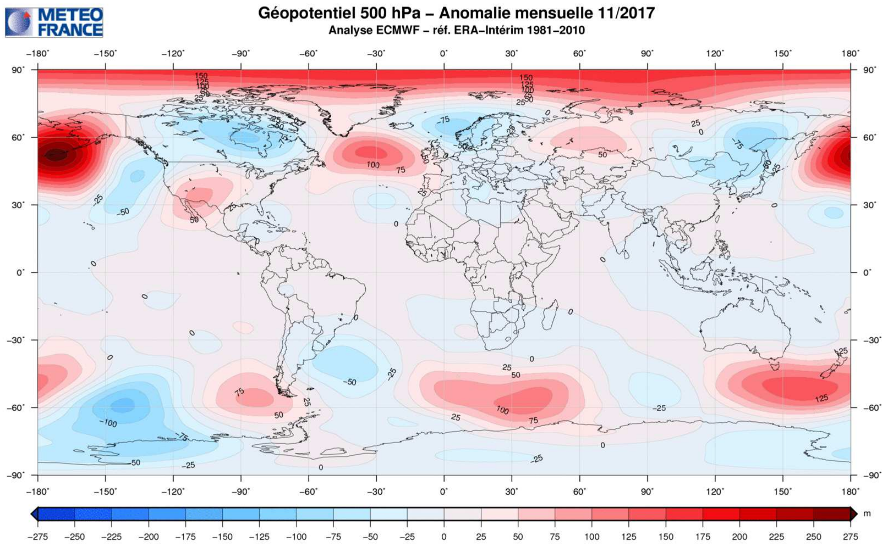


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
NOV 17	-0.1	0.1	0.7	0.4	-2.0	---	-1.2	-0.1	-2.2
OCT 17	0.7	0.6	0.7	-0.6	-0.3	---	0.0	0.3	-1.2
SEP 17	-0.5	1.6	-1.2	-0.5	-0.3	---	-2.5	0.5	-1.7
AUG 17	-1.5	2.0	-1.4	-1.6	0.2	---	-2.9	-1.6	1.8
JUL 17	1.3	1.8	0.5	0.0	1.3	---	-0.6	0.0	-0.1
JUN 17	0.4	2.0	-0.8	0.5	1.2	---	0.3	-1.4	-0.1
MAY 17	-1.7	0.5	0.7	-0.7	-0.2	---	1.5	0.9	0.5
APR 17	1.7	-0.6	-0.4	1.0	0.1	---	0.7	-1.5	-1.4

Evolution of the main atmospheric indices for the Northern Hemisphere for the last 6 months. (see http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/table3.shtml for the most recent 13 months).

Sea level pressure and circulation types over Europe

In the monthly mean pressure distribution the Iceland low appeared to be shifted to Scandinavia. The Azores high is shifted to nort-east. The maximum pressure anomalies of more than +10 hpa were located south of Iceland. The lowest pressure anomalies with below -5 hPa could be found over Scandinavia. The circulation indices in November were not well pronounced for the European sector although the Pacific/ North American Pattern (PNA) and Polar/ Eurasia Pattern (POLEUR) have values below -2.

The DWD Hess/Brezowsky classification showed most of the month a westerly flow over Central Europe with several interruptions.

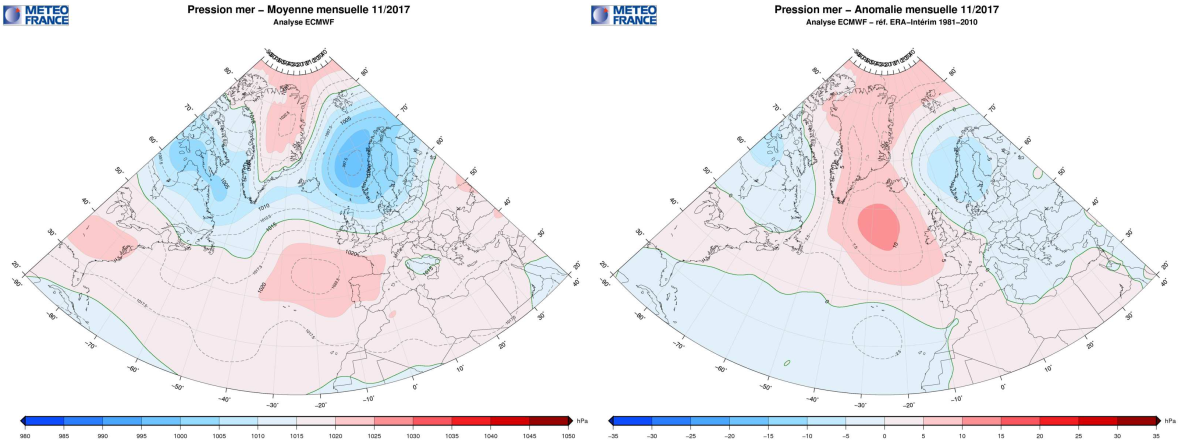


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (top) and 1981-2010 anomalies (bottom).

Circulation indices: NAO and AO

NAO had a positive phase up to the 16th of November with a maximum of more than 1 around the 6th. The last 14 days NAO was mostly negative.

AO was in a positive phase up to the 11th and negative from the 16th onwards.

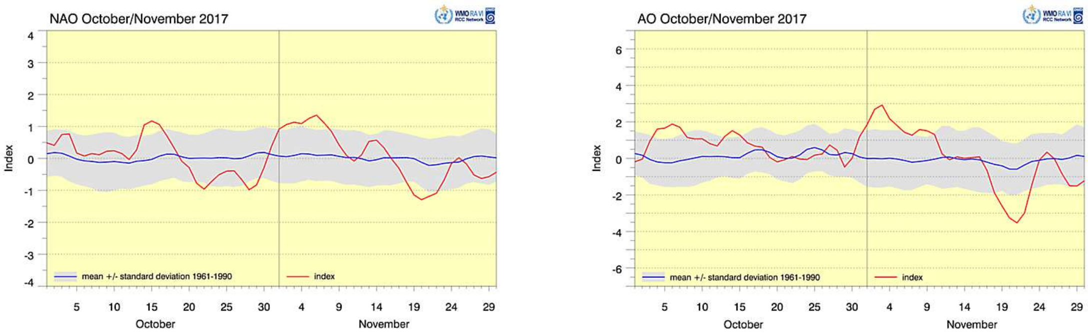


fig.I.2.5: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov /products/precip/CWlink/daily_ao_index/teleconnections.shtml

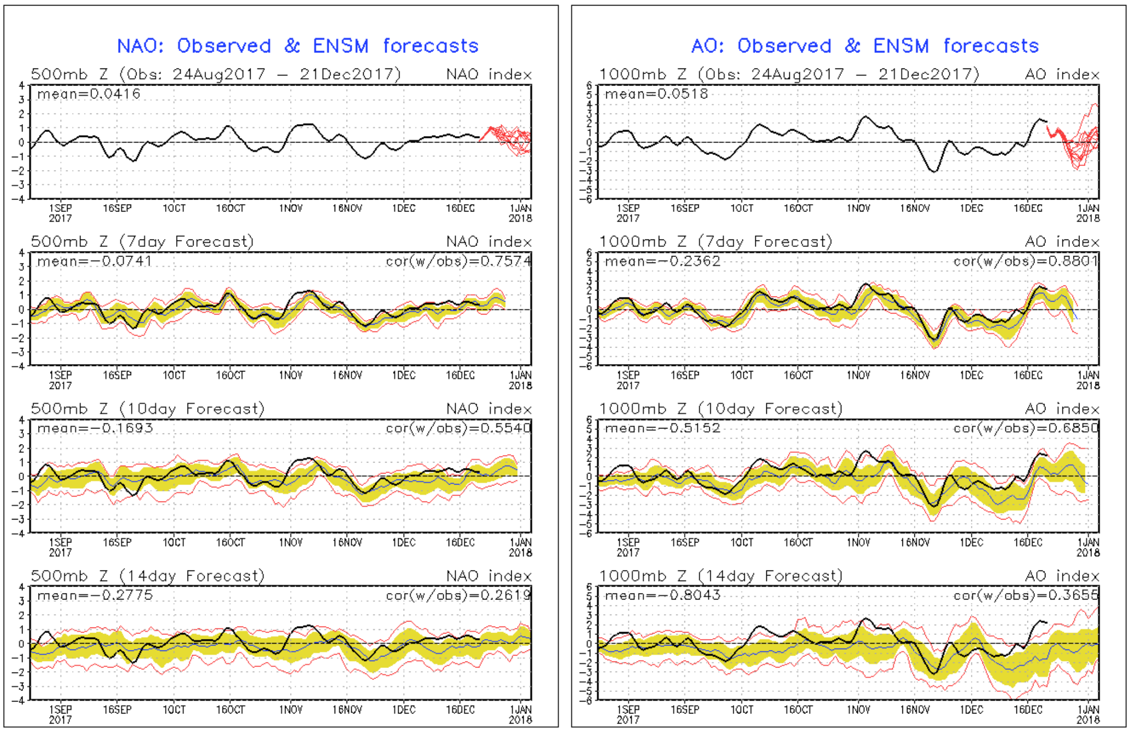


fig. I.2.5a: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices for the last 4 months and forecasts for the following weeks. Source: NOAA CPC, http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

- In the equator belt, in agreement with SST anomalies and velocity potential anomalies, above normal rainfall on the Maritime Continent and Indian Ocean and more locally on Africa, and below normal over the Equatorial Pacific, America and Atlantic Ocean.
- Over Europe, consistent with Z500 anomalies, strong contrast between the South-West of the continent (very dry) an Central Europe (wet).

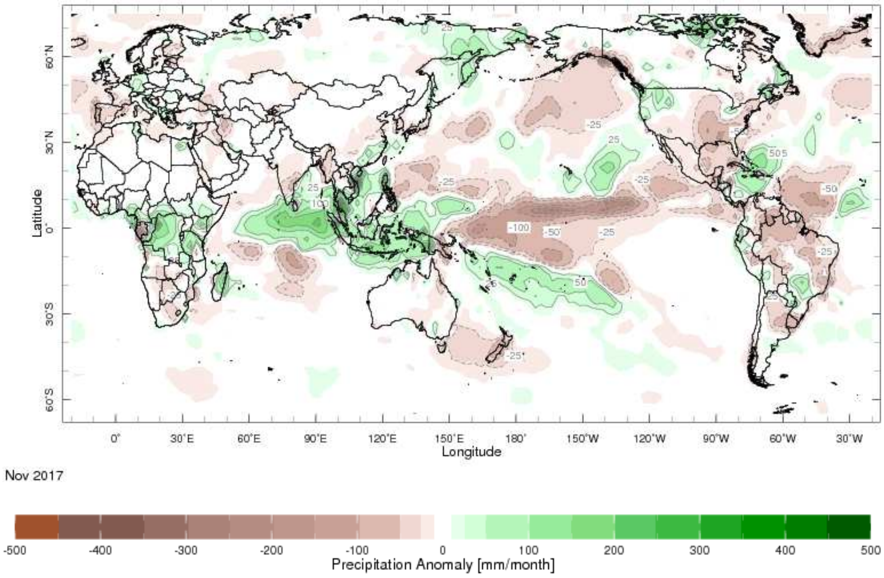


fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal).
Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation anomalies in Europe:

Above-normal precipitation occurred in southern Scandinavia, Central Europe and the Balkans while south-western and western Europe received below normal precipitation and suffer from drought. Norway was affected heavy precipitation with monthly totals of up to 600 mm. Cyclone "Numa" stood for several days in the Ionian Sea with monthly totals of up to 600 mm. At Kerkyra Airport (Greece) 439 mm was measured between the 11th and 13th of November with flash floods and 14 people lost their lives. In Montenegro and Albanie also monthly totals of up to 600 mm were measured.

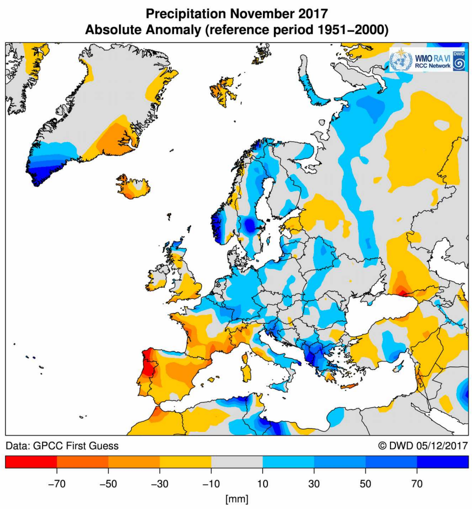


fig.I.2.7.a : Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

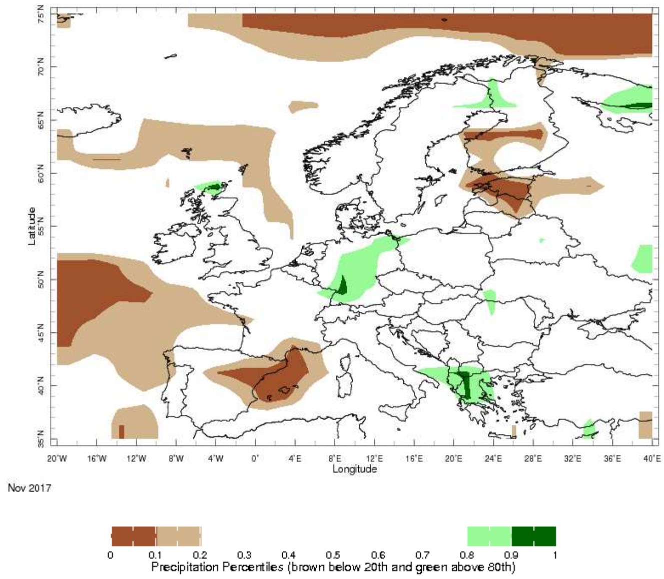


fig.I.2.7.b : Percentiles of precipitation, 1981-2010 reference. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

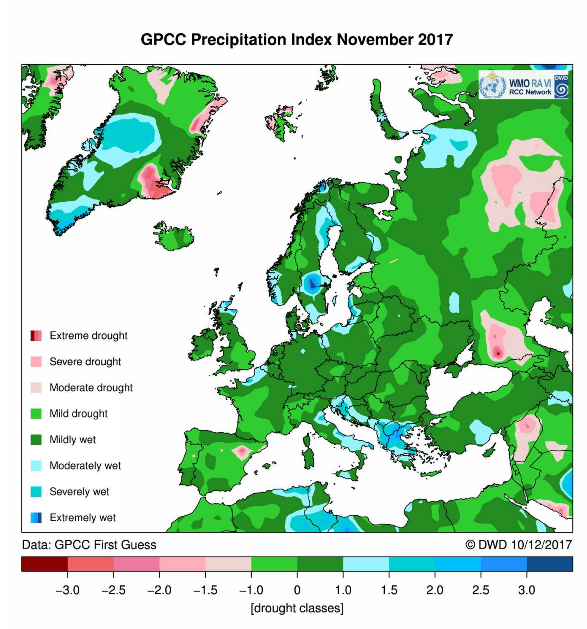


fig. I.2.8: GPCC Precipitation Index, http://www.dwd.de/rcc-cm .

Monthly mean precipitation anomalies in European subregions. Subregions refer to ECMWF land boxes defined in Annex III.3. Anomalies are based on gridded data from GPCC First Guess Product, ftp://ftp-anon.dwd.de /pub/data/gpcc/PDF/GPCC_intro_products_2008.pdf, 1951-2000 reference.

Subregion	**Absolute anomaly**	**GPCC Drought Index**
Northern Europe	+9.0 mm	+ 0.550
Southern Europe	- 5.2 mm	+0.359

Please note: new drought index since January 2016. The GPCC drought index, which also considers evaporation in addition to precipitation replaces the former SPI-DWD.

I.2.c Temperature

- Weak negative anomaly over western Europe and positive over Eastern Europe.
- Strong warm anomaly from Russia to the West part of Siberia and Kazakhstan. Cold anomaly on Eastern Siberia and Northern China.
- over North America, strong positive anomalies aver Alaska and Western Canada. Strong cold anomaly over Canada.

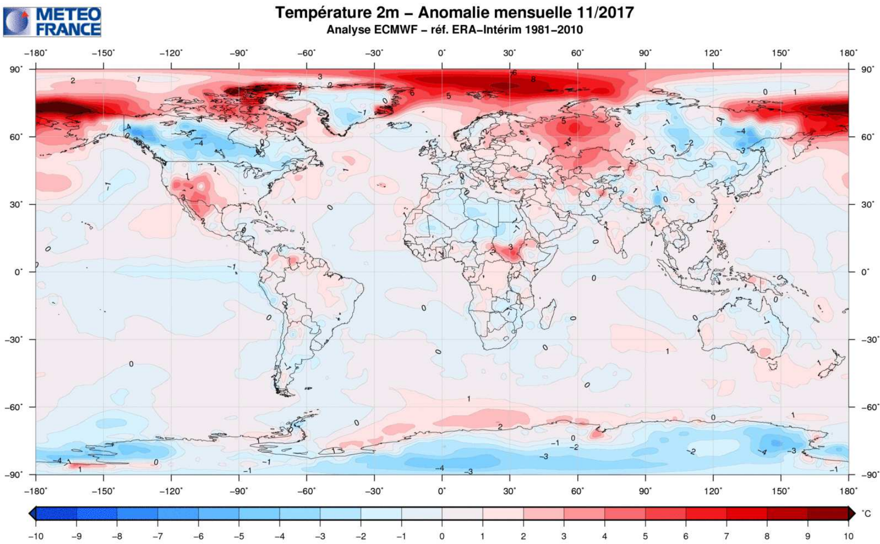


fig.I.2.9: Temperature Anomalies (℃) (Meteo-France)

Temperature anomalies in Europe:

The north-western and southern Europe and northern Africa were slightly colder than normal while eastern Europe was warmer than normal. Very mild in the Arctic region due to warm air advection (Svalbard airport anomalies of +6.7 ℃).

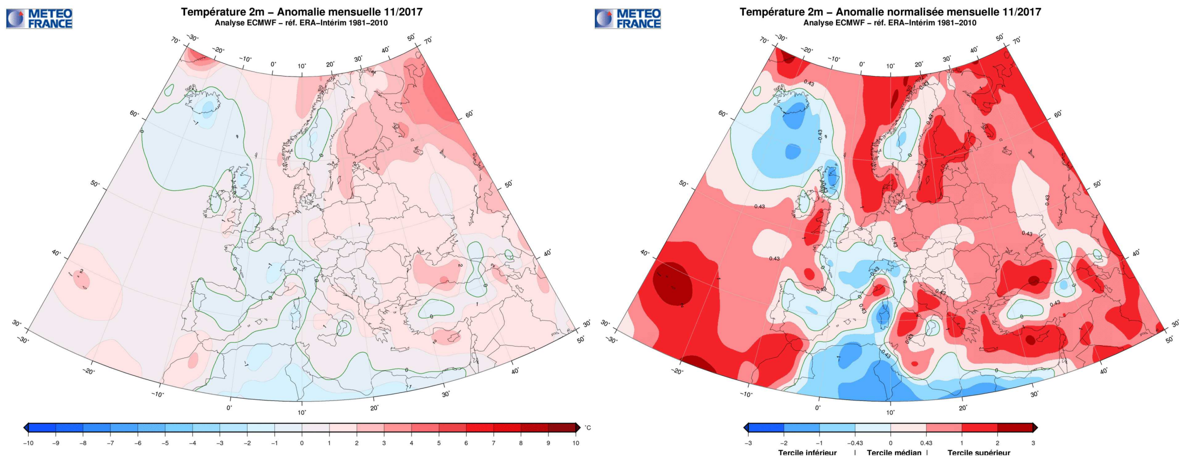


fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

Monthly mean temperature anomalies in European subregions: Subregions refer to ECMWF land boxes defined in Annex III.3. Anomalies are based on gridded CLIMAT data from DWD, http://www.dwd.de/rcc-cm, 1961-1990 reference.

Subregion	Anomaly
Northern Europe	+ 0.7 ℃
Southern Europe	+ 0.4 ℃

I.2.d Sea ice

- In the Arctic, sea ice extent near record (around -2 SD) in November.
- Fort the Antarctic, the deficit is still very important, with values near -2 SD.

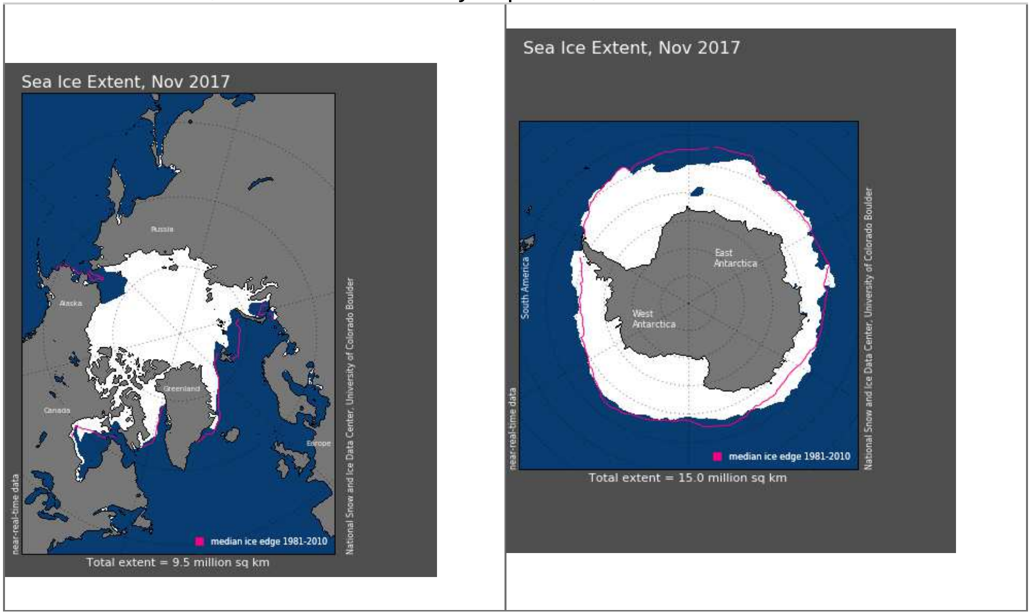


fig.I.2.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

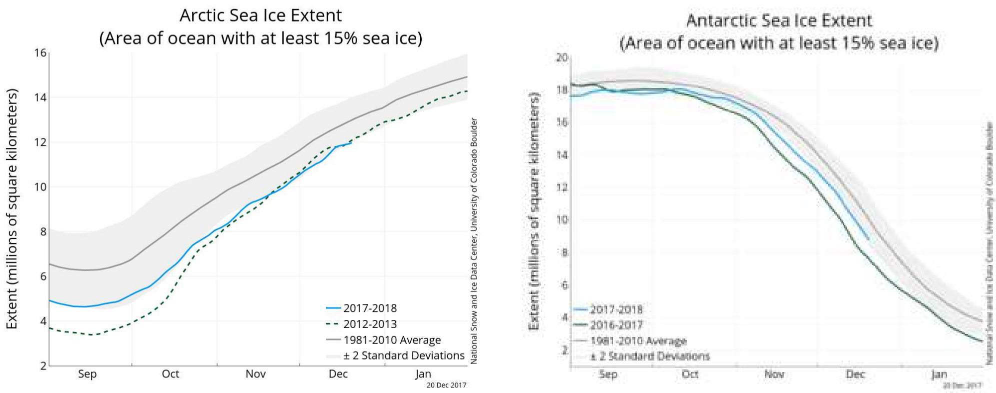
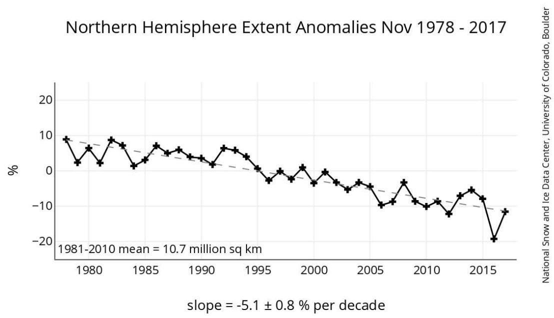


fig. I.2.12 : Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images/daily_images /N_stddev_timeseries.png



Monthly Sea Ice Extent Anomaly Graph in Arctic for the month of analysis.
http://nsidc.org/data/seaice_index/images/n_plot_hires.png

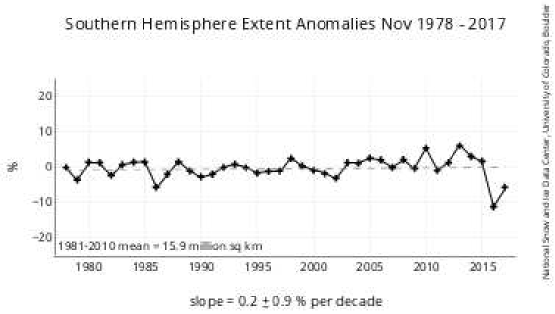


fig 1.2.13 : Monthly Sea Ice Extent Anomaly Graph in Antarctic for the month of analysis (http://nsidc.org/data/seaice_index/)

II. SEASONAL FORECAST FROM DYNAMICAL MODELS

La Niña phenomenon is now well in place in the Pacific Ocean and order all the tropical belt. Because of this major forcing, the climat system previsibility is strengthened and models consistency are very good for the next 3 months.

II.1. OCEANIC FORECASTS

II.1.a Sea surface temperature (SST, figure II.1.1 to II.1.4)

Models in very good agreement this month.

- Pacific Ocean: in the context of the ongoing La Niña episode, continuation of the strong SST negative anomaly for the next 3 months, on a large Eastern part of equator railway and south tropical area. Continuation of warn anomalies near the Maritime Continent in the North tropical area, especially near the coast of California.
- Indian Ocean: neutral conditions in the North hemisphere, but warm/cool will continue between the western and the eastern basin in the southern hemisphere
- Atlantic Ocean: in the north tropics, weak positive anomalies should continue, while in the south tropics, SST should cool down quite clearly.
  In the northern hemisphere, the "cold blob" cold anomalies will continue in the south of Greenland and Iceland.
- Mediterranean Sea : the models forecast generalized positive anomalies in contradiction with the recent change of the SST.

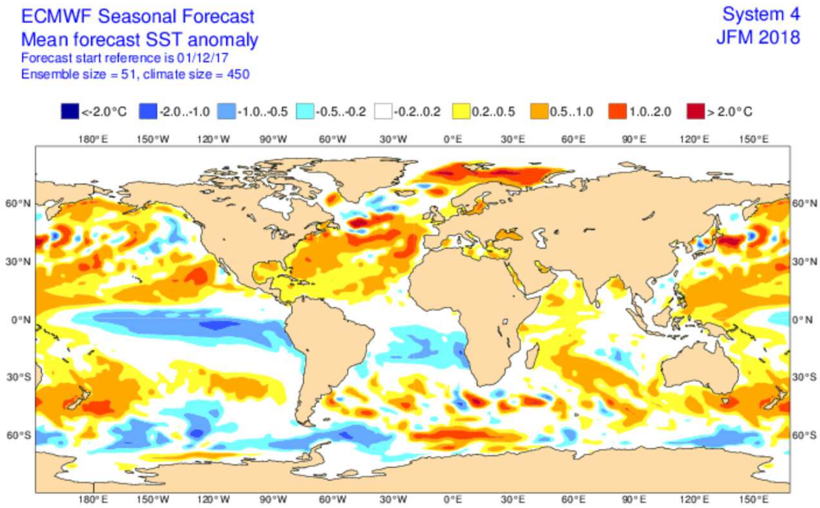


fig.II.1.1: SST anomaly forecast from ECMWF
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

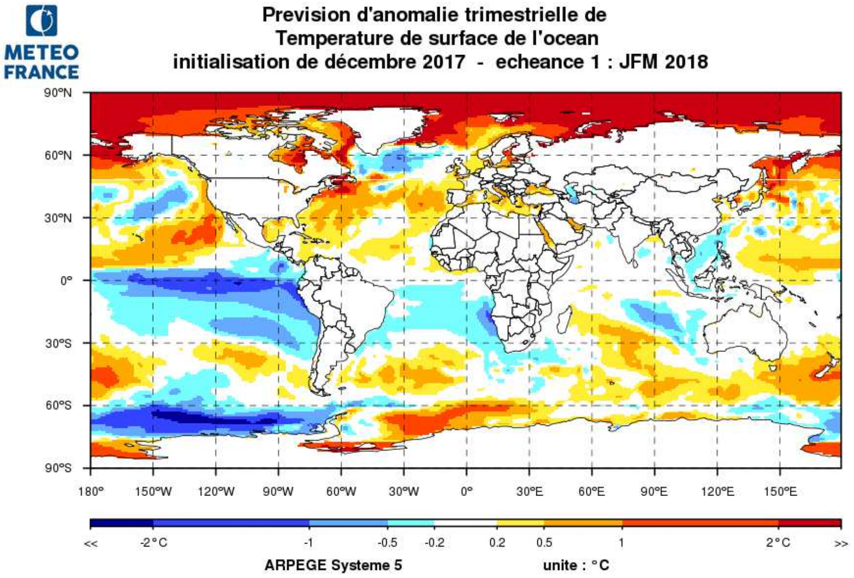


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation).
http://seasonal.meteo.fr

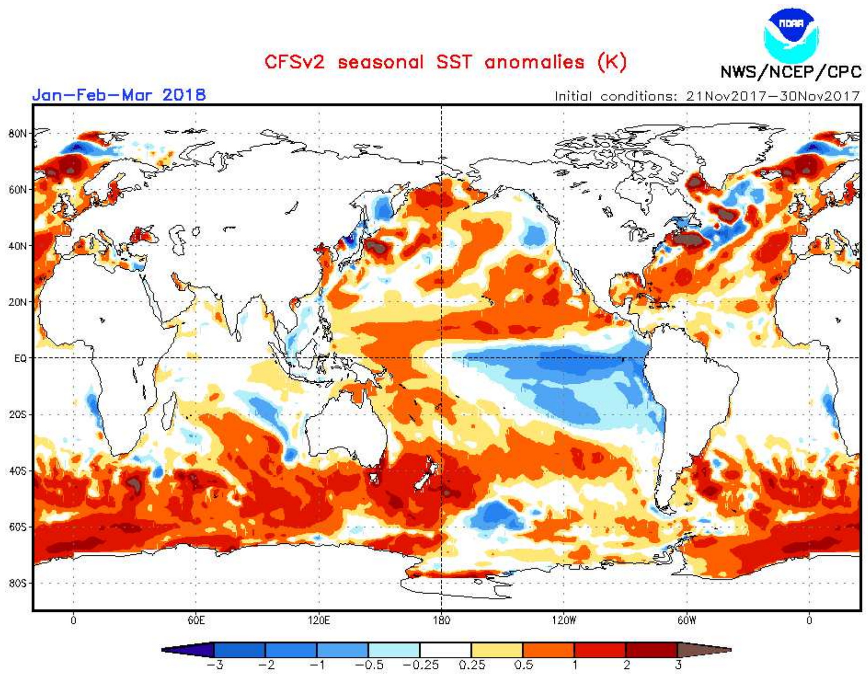


fig.II.1.3: SST Anomaly forecast from NCEP.
http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/imagesInd1/glbSSTSeaInd1.gif

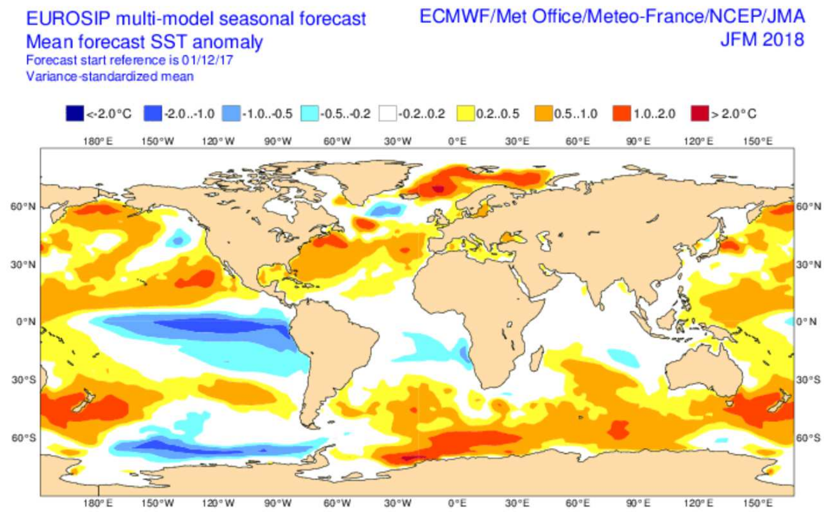
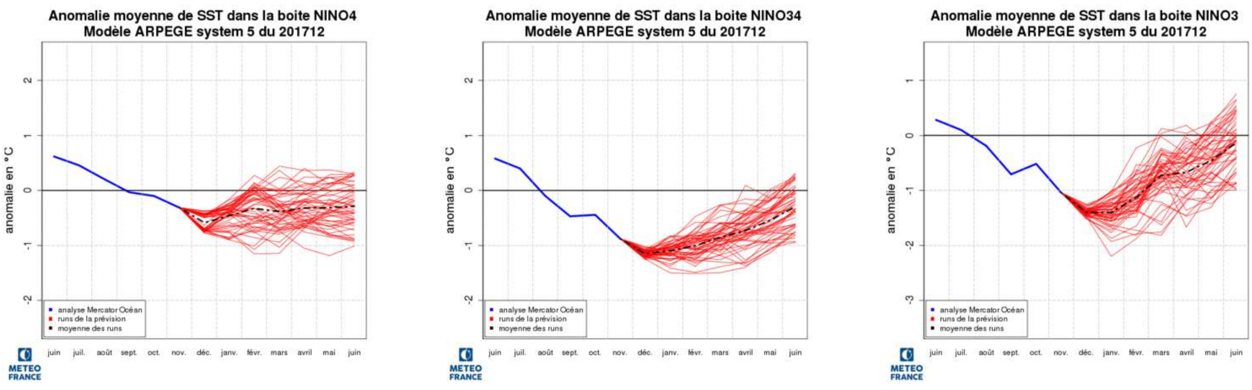


fig.II.1.4: SST Forecasted anomaly from Euro-SIP

II.1.b ENSO forecast :

***Forecast Phase*: moderate La Niña likely for the next three-month period.**

The models are unanimous in the classical course of the current La Niña phase with maximum negative anomalies in December, of the order of -1 °C in the Nino3.4 box (a little more intense with MF-S5 than MF-S6 and ECMWF-S5). then a gradual recovery of the SST in the first half of 2018.



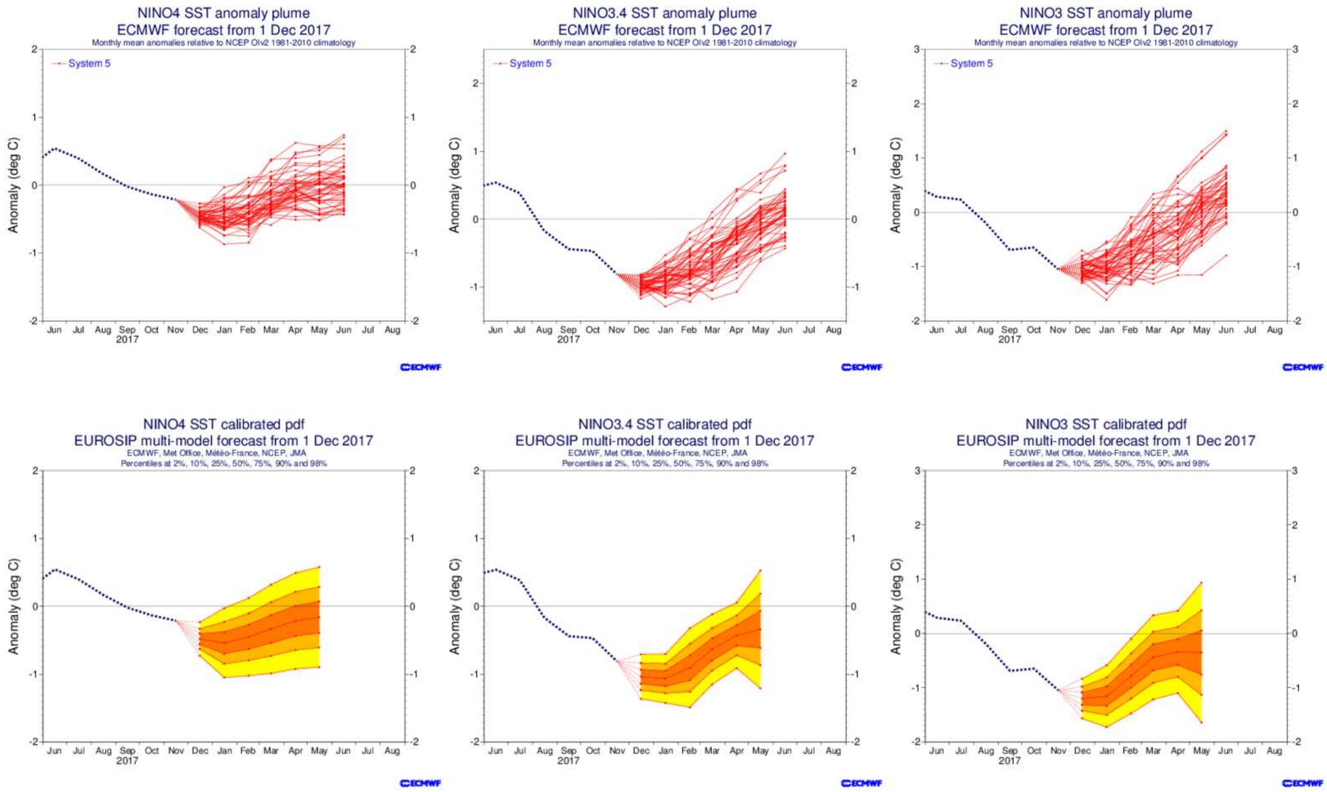


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members -
and EUROSIP (bottom) – recalibrated distributions -
(http://seasonal.meteo.fr , http://www.ecmwf.int/)

I.1.c Atlantic ocean forecasts

Neutral conditions forecasted

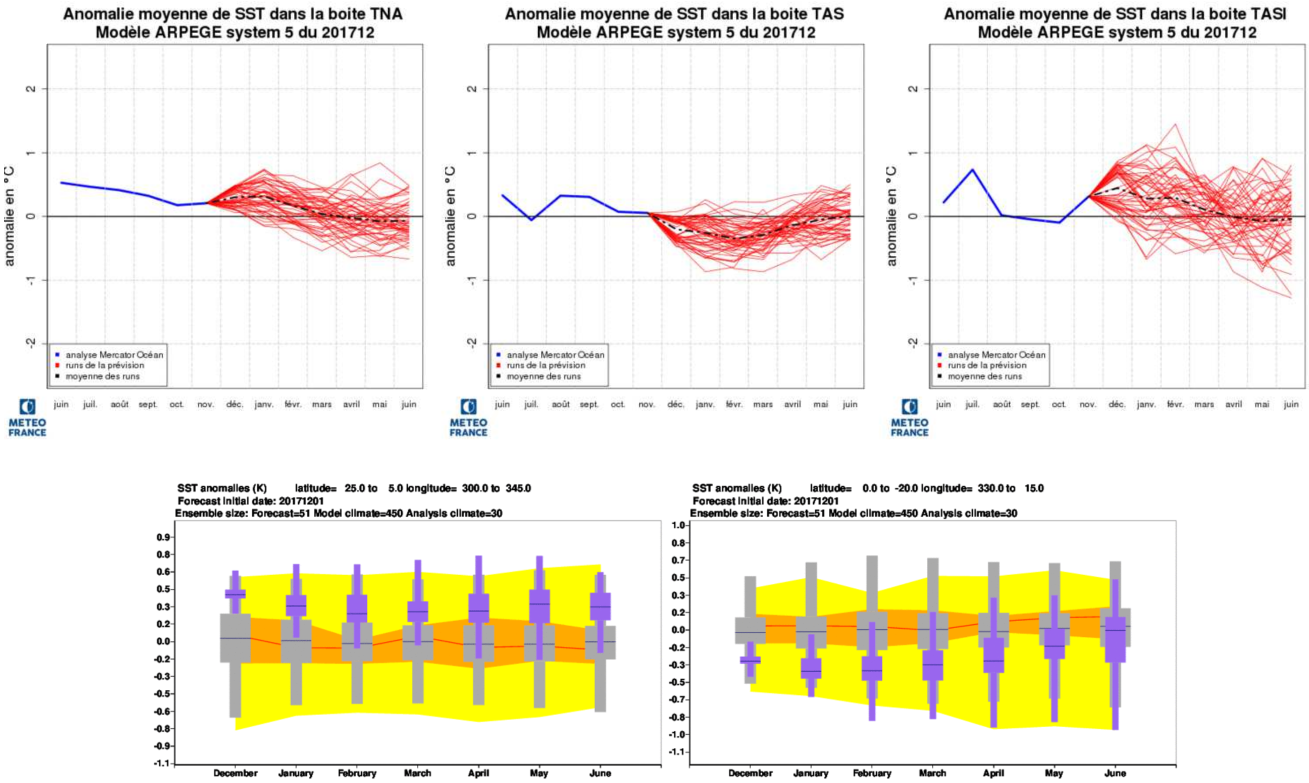


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

I.1.d Indian ocean forecasts

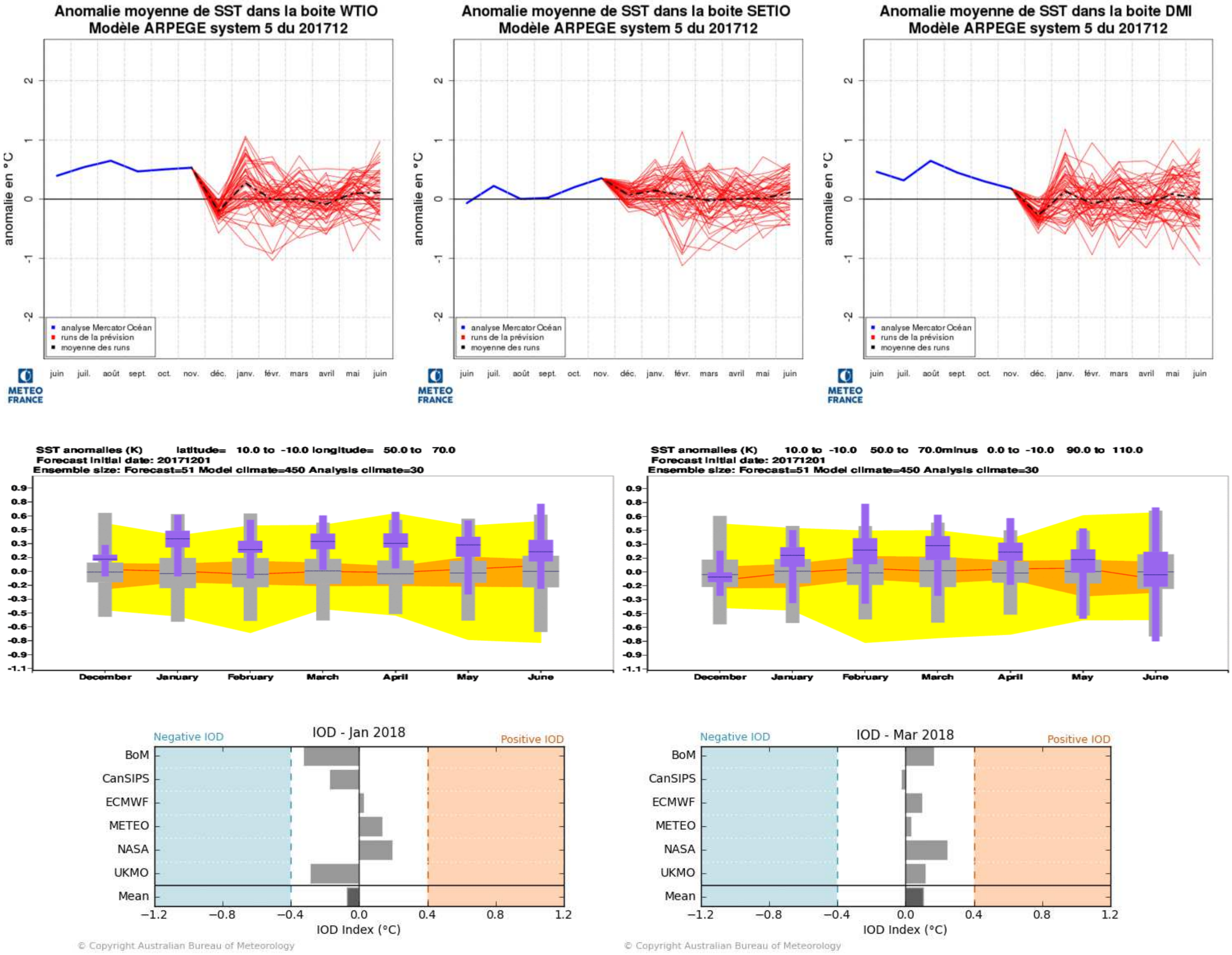
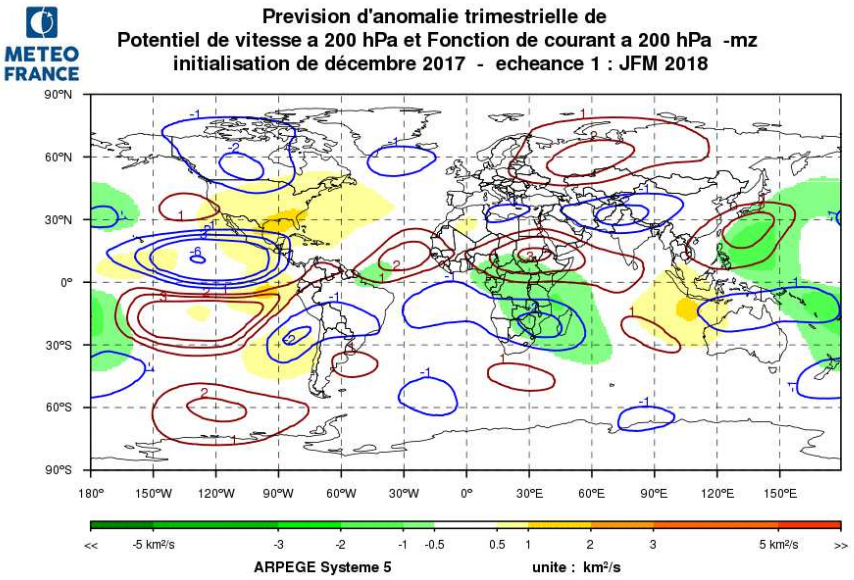


fig.II.1.7: SST anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Velocity potential anomaly field and Stream Function anomaly field

- Velocity potential :
  - MF, ECMWF and JMA are in good agreement for the atmosphere general structure of La Niña-like response, but there is little differences in anomalies distribution.
    Models forecast a downward motion anomaly in the East part of the Pacific Ocean and Central America (JMA is less clear in this option) and an upward motion anomaly on the Maritime Continent (MF5 moves it to the Western Pacific, and adds a little downward motion kernel North-West of Australia linked with SST negative anomaly).
  - An other upward motion area is likely on the Western Indian Ocean and Equatorial Africa (a little less extended to the west in CEP), while a downward motion anomaly area should cover South Atlantic and West Africa (less extended in MF5).
- Stream Function :
  - Ninã-like response over the tropical Pacific. In the Northern hemisphere, MF and ECMWF make a teleconnection (PNA-) up to North America. ECMWF even suggests an extension to the Atlantic.
  - The consequences of the downward motion area on East-Africa should be reflected in stream function with a forecast anticyclonic anomaly on both sides of the equator and a teleconnection to Russia (stronger in MF5).



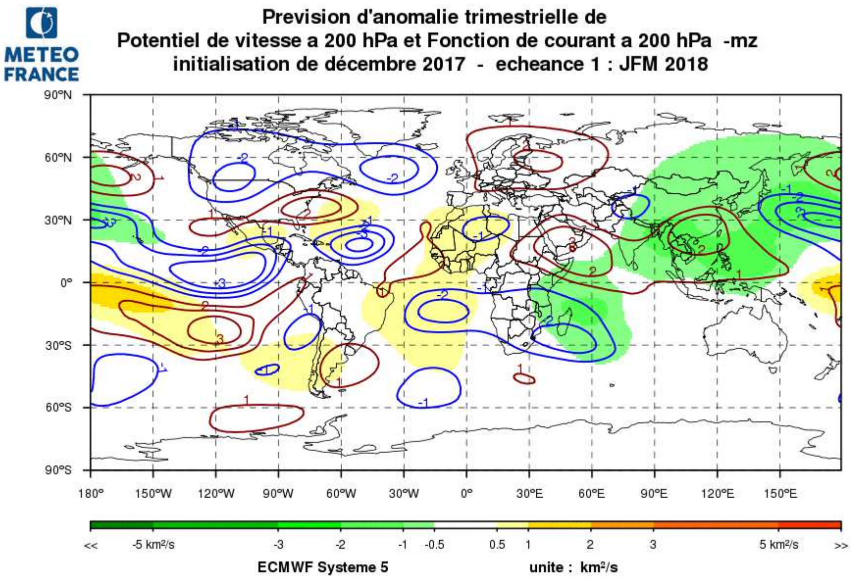


fig.II.2.a: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom). http://seasonal.meteo.fr

II.2.b Geopotential height anomalies

In the continuity of last month the ECMWF and MF models are remarkably close especially from America to the Atlantic and Europe.
The negative PNA pattern is stronger and more canonical in ECMWF.
The negative anomaly is a bit more off to the North Sea in MF5.
Linked with a more structured teleconnection, the positive anomaly over Russia is stronger in MF5.

We therefore favor a circulation of intermediate type between NAO + EA +.

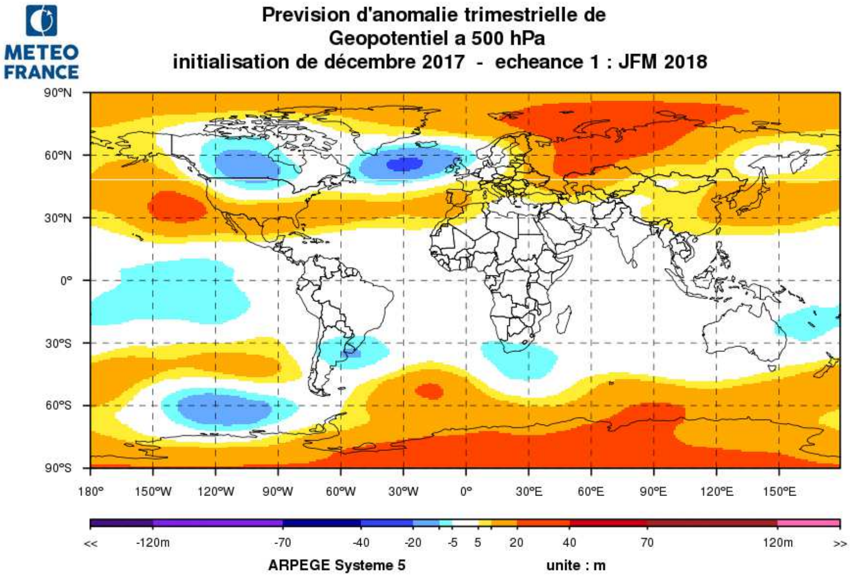


fig.II.2.b.1: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

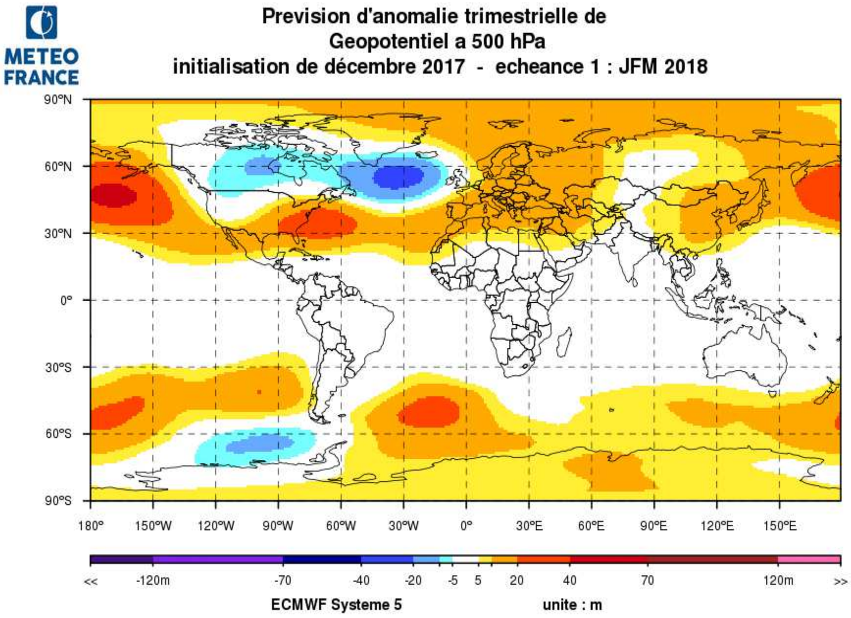


fig.II.2.b.2: Anomalies of Geopotential Height at 500 hPa from ECMWF.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast

II.2.c. modes of variability

MF-S5 forecasts a strong anticyclone over Russia which favors the SCAN mode while EA mode is neutral.

The PNA- mode is very much in the majority (3/4 of runs). NAO+ is is reinforced (60%).

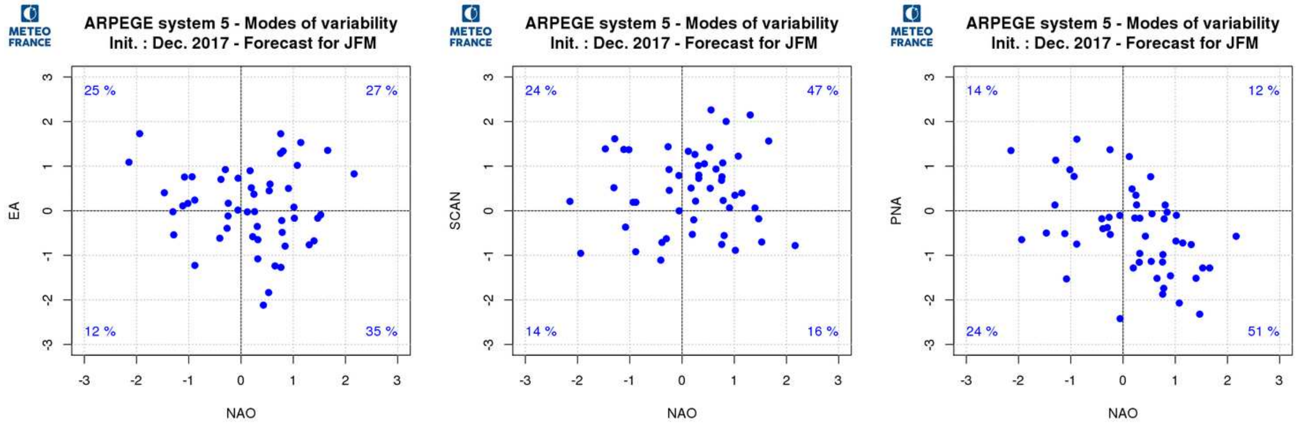


fig.II.2.c : modes of variability forcasts over the Northern hemisphere with Meteo-France ARPEGE-S5

II.2.d. weather regimes

The NAO + PMER weather regime is expected to be more frequent than normal with a climatological gap significant at 10%. The frequency of the regimes cumulated on a daily time step is quite contradictory with the modes of variability calculated on 3-months mean fields. This apparent contradiction is due to the difference between the patterns of NAO + modes and NAO + weather regimes : the anticyclonic anomaly is centered in Eastern Scandinavia for the modes, whereas it is centered on the North Sea for the PMER regimes.

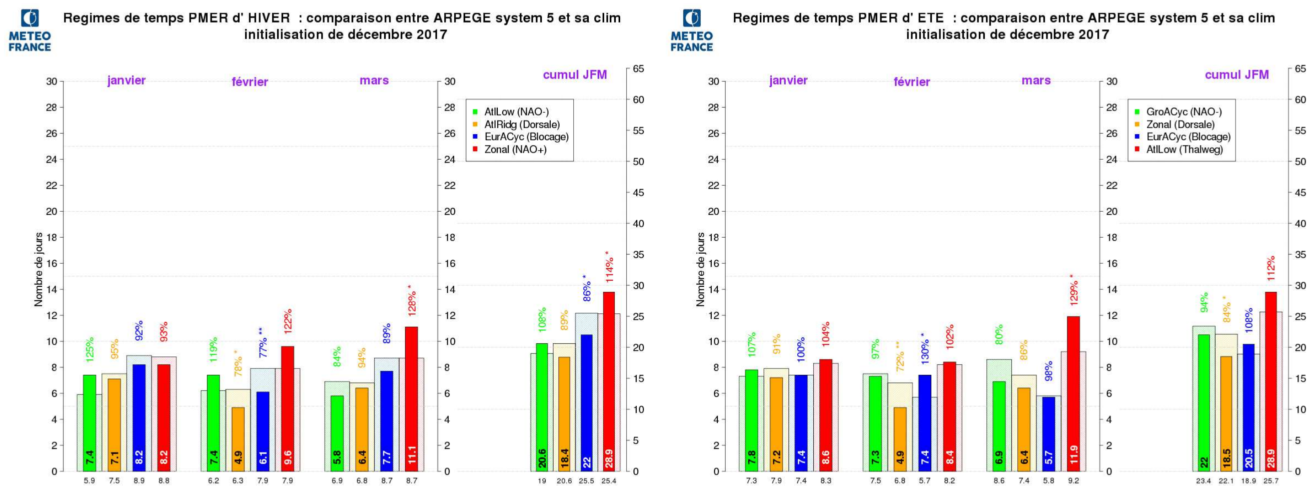


fig.II.2.d: North Atlantic Regime occurrence anomalies from Meteo-France ARPEGE-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

II.3. IMPACT: TEMPERATURE FORECASTS (figure II.3.1 to II.3.4)

For Europe and the Mediterranean sea, all models favor the warm tercile. Consistent with EA+ mode of variability, -sea http://seasonal.meteo.fr/fr/content/suivi-clim-modes-impacts -, the probability is stronger in the South-West of the continent, the West Mediterranean sea and West part of North Africa (EUROSIP, ECMWF- S5 and to a lesser extent MF-S5).

For Asia, models are less consistent, with rather warm probability tendency except over India where models often forecast neutral conditions or no tendency.

No tendency or neutral conditions over Maritime Continent and Australia

For North America, in connect with the PNA- structure, all models forecast a North-West/South-East gradient from cold or normal on Western Canada to Warm over Mexico, Florida and Caribbean.

For South America, near normal conditions except for North-Eastern Brasil where warmer than normal conditions are excepted.

No clear tendency for Africa.

II.3.a Météo-France

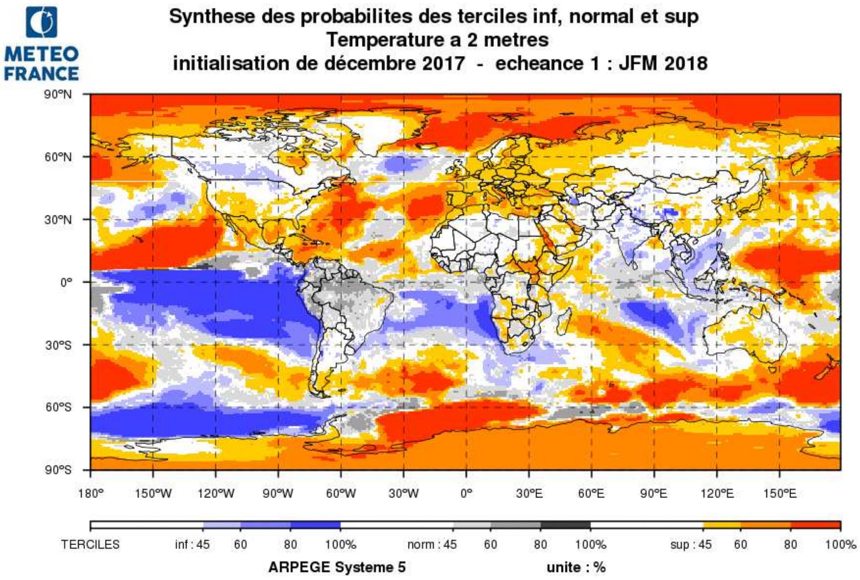


fig.II.3.1: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.3.b ECMWF

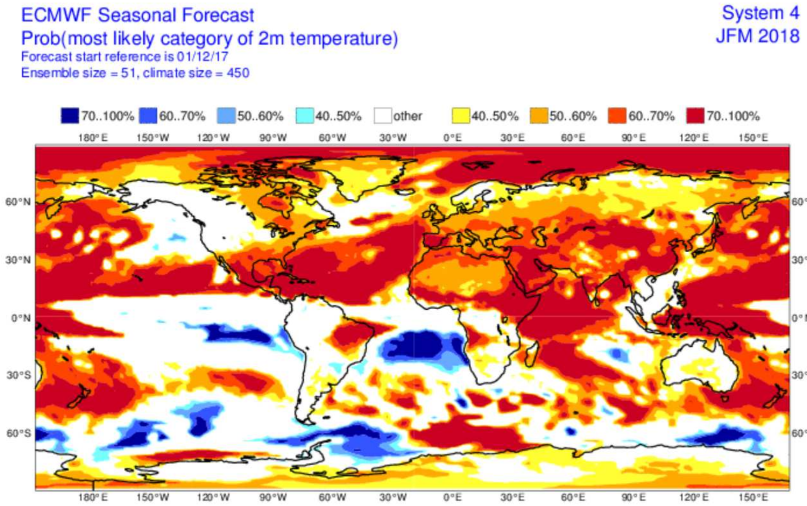


fig.II.3.2: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seaso...

II.3.c Japan Meteorological Agency (JMA)

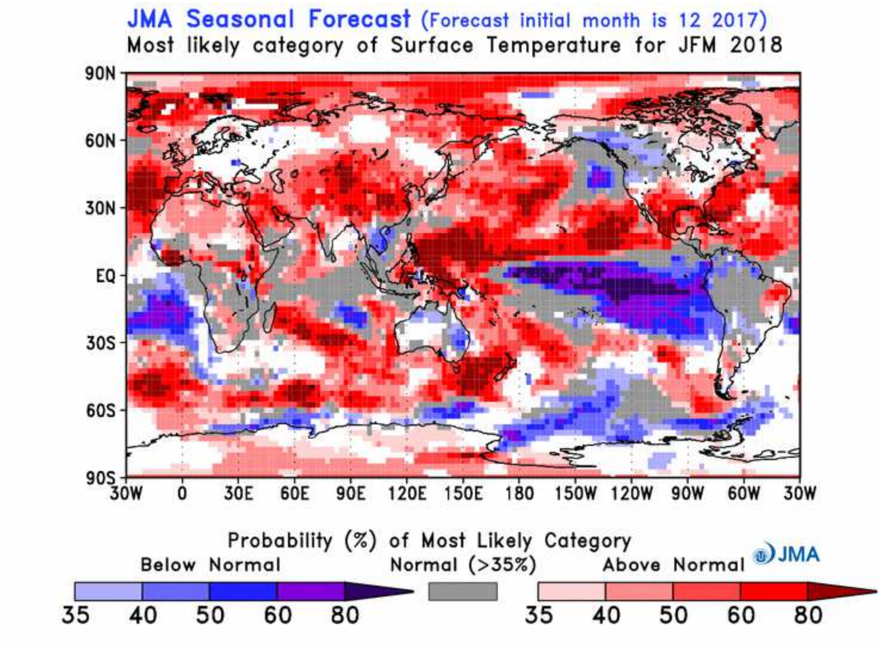


fig.II.3.3: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.3.d EUROSIP

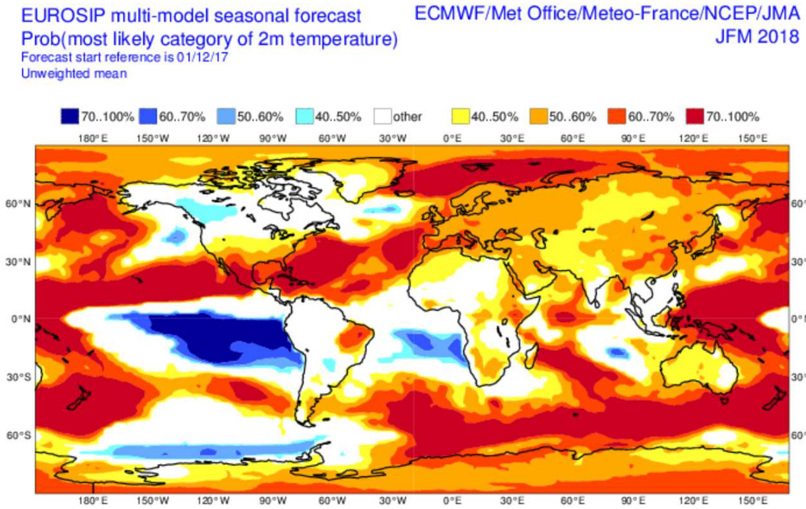


fig.II.3.4: Multi-Model Probabilistic forecasts for T2m from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.4. IMPACT : PRECIPITATION FORECAST

- Over Europe, models forecast rather wet conditions in the North and dry in the South. The boundary between the two is very variable from model to model
- In the tropical belt, dry conditions excepted over equator and near south. Wet conditions in the North.

II.4.a Météo-France

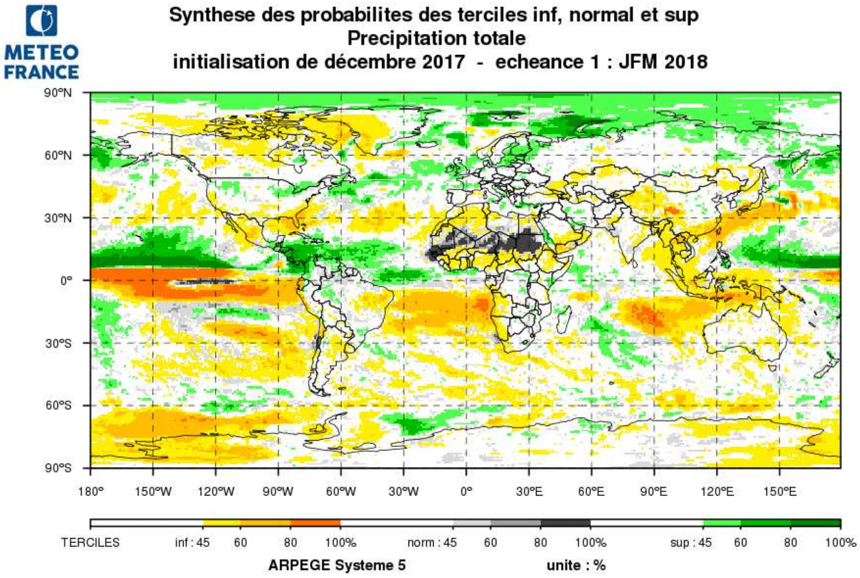


fig.II.4.1: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.4.b ECMWF

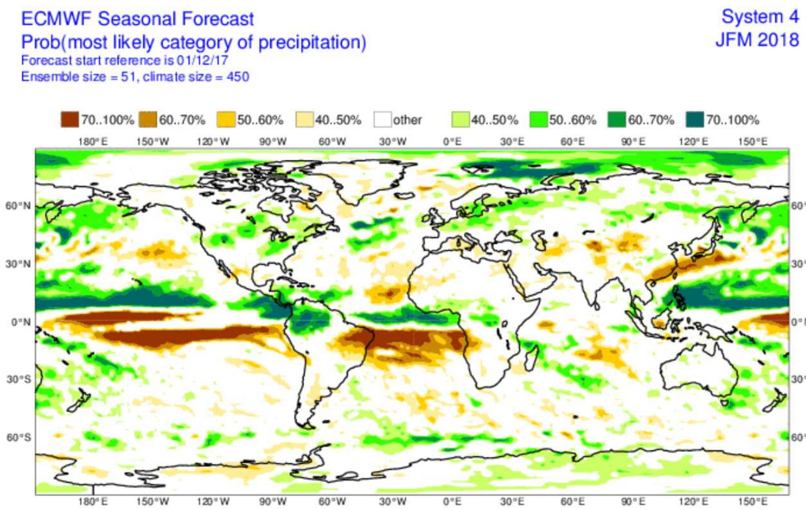


fig.II.4.2: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.4.c Japan Meteorological Agency (JMA)

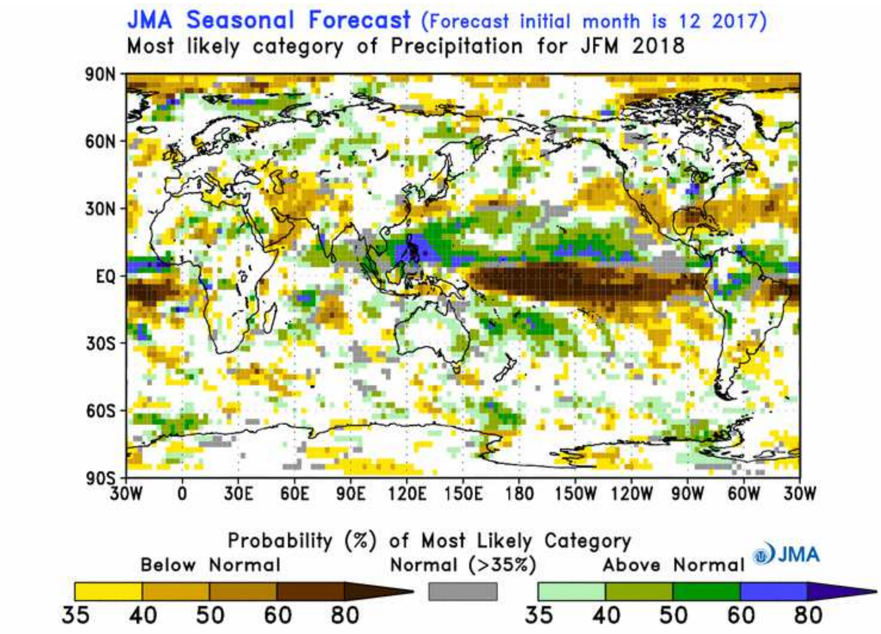


fig.II.4.3: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.4.d EUROSIP

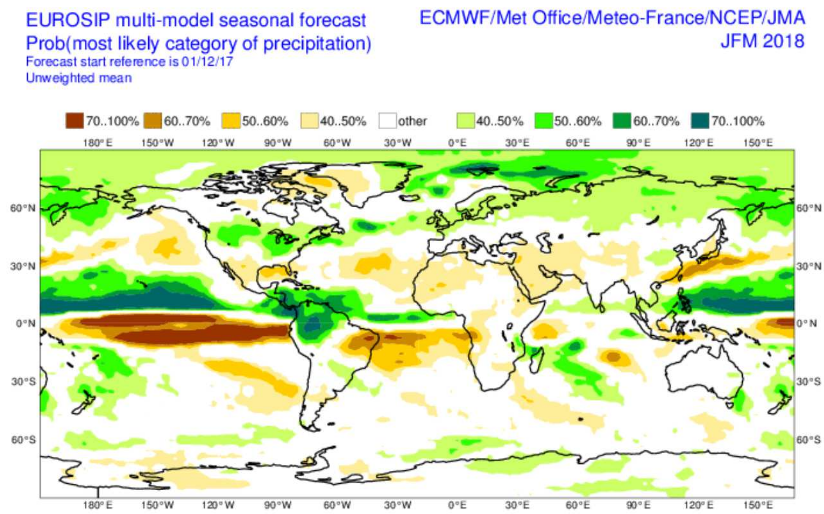


fig.II.4.4: Multi-Model Probabilistic forecasts for precipitation from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro /seasonal_charts_2tm/

II.5. REGIONAL TEMPERATURES and PRECIPITATION

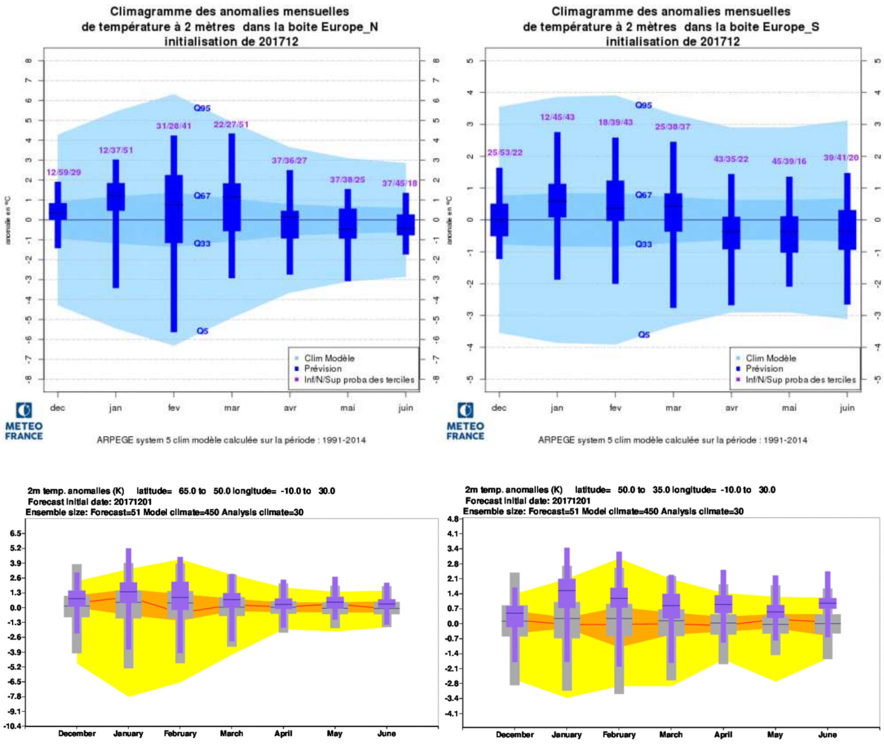


fig.II.5.1 : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

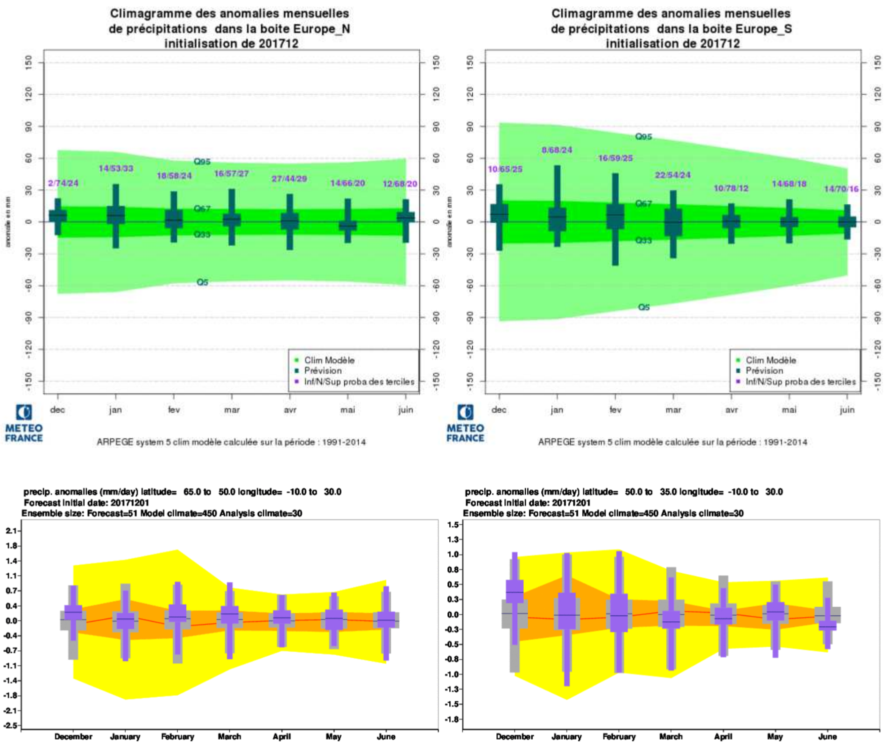


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

II.6. "EXTREME" SCENARIOS

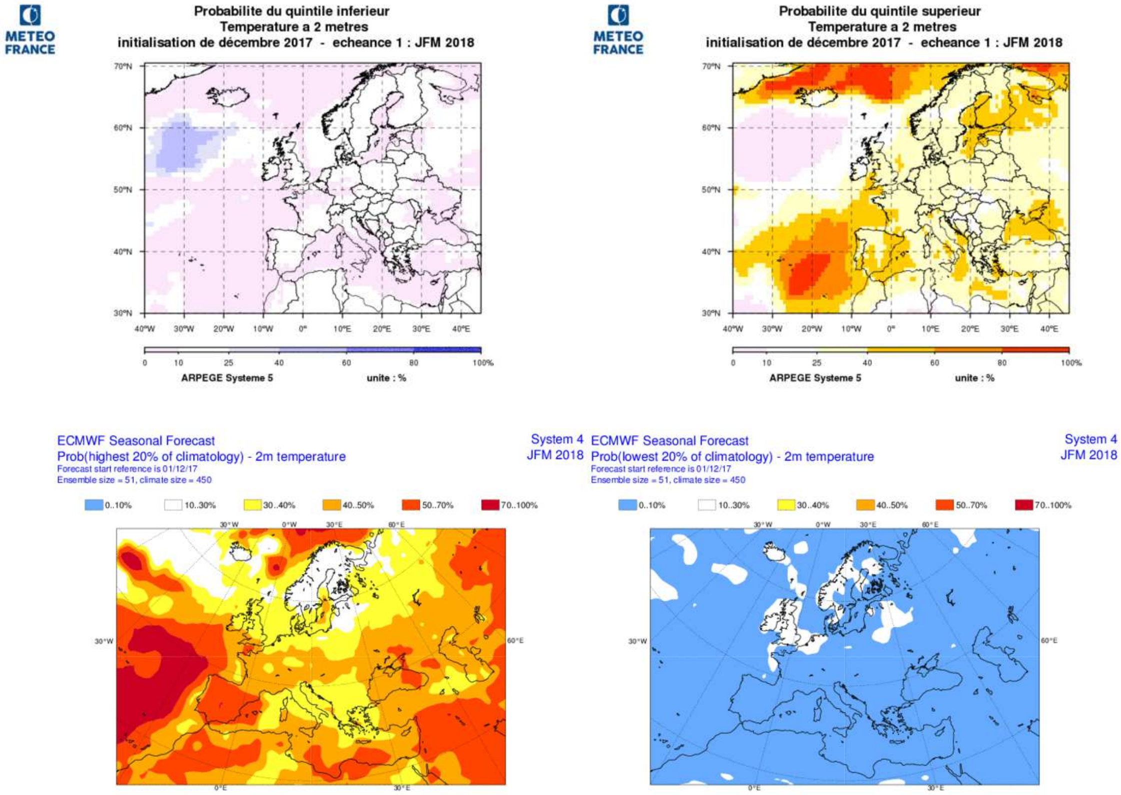


fig.II.6.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - highest ~20% of the distribution) and "extreme" above normal conditions (right – lowest ~20% of the distribution).

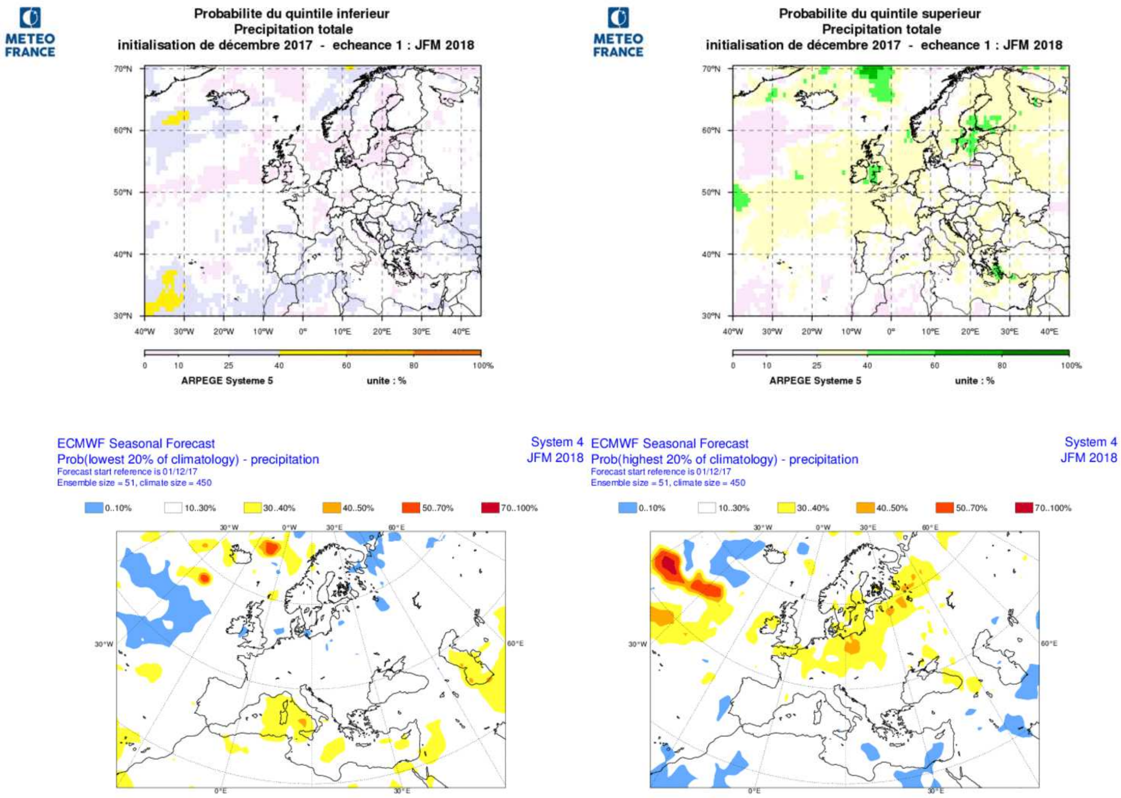
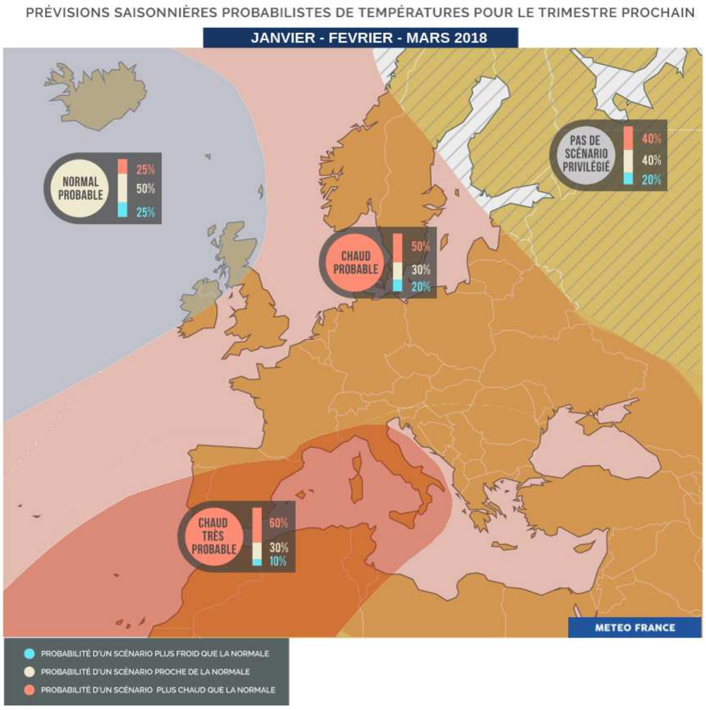


fig.II.6.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left - lowest ~20% of the distribution) and "extreme" above normal conditions (right – highest ~20% of the distribution).

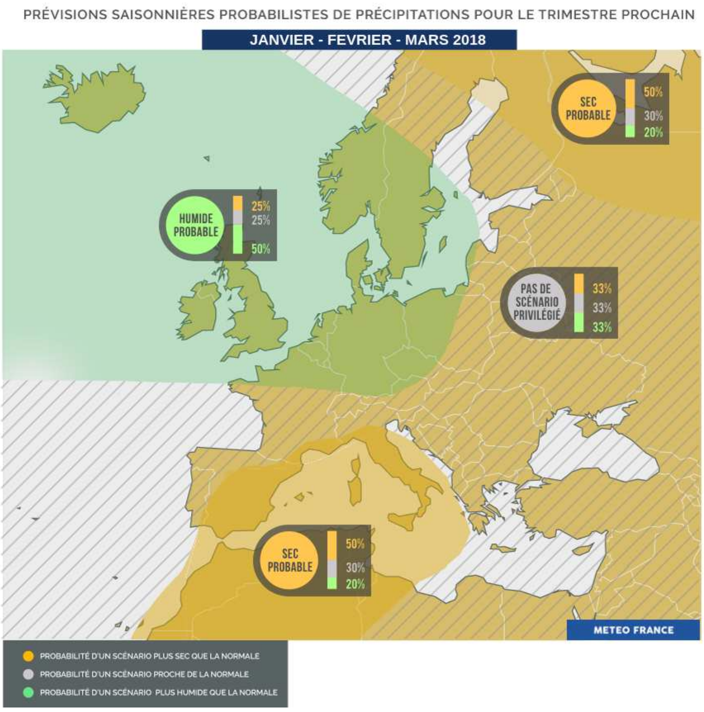
II.7. DISCUSSION AND SUMMARY

II.7.a Forecast over Europe

Temperatures : a warm scenario is likely over on all Europe with a higher probability for Southern Europe, the western Mediterranean sea and Western Maghreb.



Précipitations : with a NAO+ mode favored on the North-West of the Continent, the wet probability is enhanced for this area. With likely high geopotentiel over the Mediterranean Sea and Eastern Europe - EA mode - dry conditions have enforced probability on Mediterranean basin.



II.7.b Tropical cyclone activity

Below-normal activity likely for Pacific -consistent with La Niña- . Close to normal for the Indian Ocean.

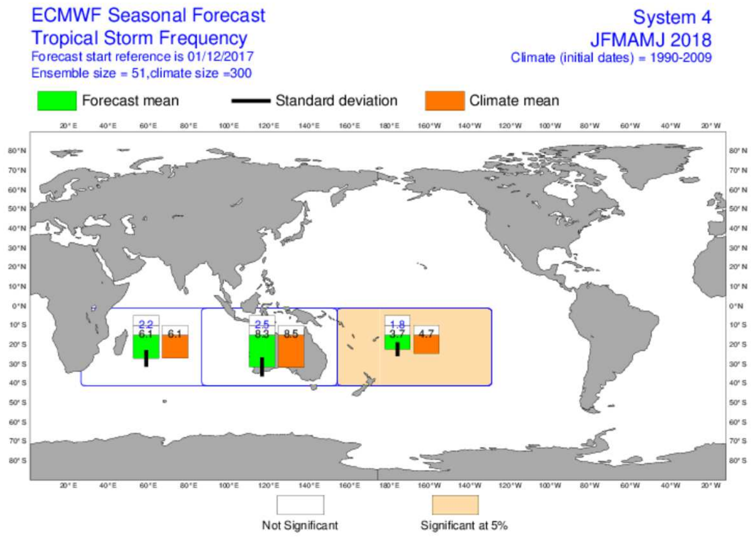


fig.II.7.1 : Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro /eurosip_tropical_storm_frequency/

III.1. Seasonal Forecasts

Presently several centers provide seasonal forecasts, especially those designated as Global Producing Centers by WMO (see http://www.wmo.int/pages/prog/wcp/wcasp/clips/producers_forecasts.html).

- BoM, CMA, CPTEC, ECMWF, JMA, KMA, Météo-France, NCEP and UK Met Office have ocean/atmosphere coupled models. The other centers have atmospheric models which are forced by a SST evolution which is prescribed for the entire period of forecast.
- LC-MME and Euro-SIP provide multi-model forecasts. Euro-Sip is presently composed using 5 models (ECMWF, MF, NCEP, UK Met Office and JMA). LC-MME uses information coming from most of the GPCs ; providing deterministic and probabilistic combinations of several coupled and forced models.

Seasonal forecasts use the ensemble technique to sample uncertainty sources inherent to these forecasts. Several Atmospheric and/or oceanic initial states are used to perform several forecasts with slightly different initial state in order to sample the uncertainty related to imperfect knowledge of the initial state of the climate system. When possible, the model uncertainty is sampled using several models or several version of the same model. The horizontal resolution of the Global models is currently between 100 and 300km. This mean that only Large Scale feature make sense in the interpretation of the issued forecasts. Generally speaking, the temperature forecasts show better skills than rainfall forecasts. Then, it exists a natural weakness of the seasonal predictability in Spring (ref to North Hemisphere).

In order to better interpret the results, it is recommended to look to verification maps and graphs which give some insight into the expected level of skill for a specific parameter, region and period. A set of scores is presented on the web-site of the Lead-Centre for Verification (see http://www.bom.gov.au/wmo/lrfvs/) ; scores are also available at the specific web site of each centers.

This bulletin collects all the information available the 21st of the current month preceding the forecasted 3-month period.

III.2. « NINO », SOI indices and Oceanic boxes

El Niño and La Niña events primarily affect tropical regions and are monitored by following the SST evolution in specific area of the equatorial Pacific.

- Niño 1+2 : 0°/10°S 80W-90W ; it is the region whe re the SST warming is developing first at the surface (especially for coastal events).

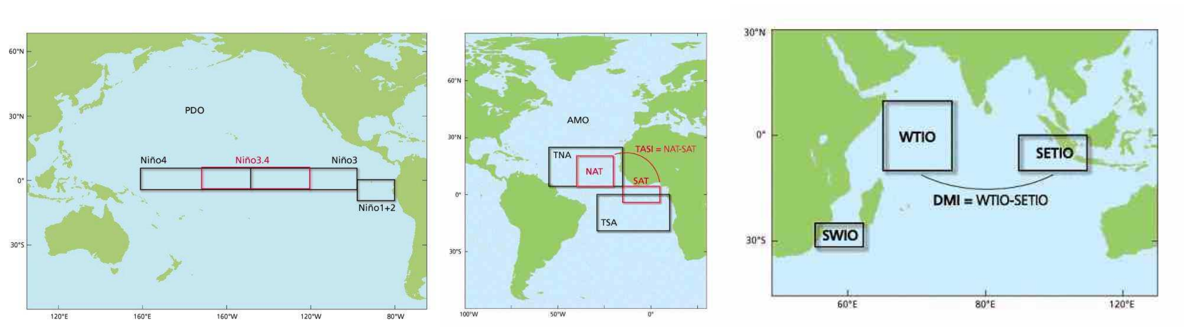
- Niño 3 : 5°S/5°N 90W-150W ; it is the region wher e the interanual variability of SST is the greatest.

- Niño 4 : 5°S/5°N 160E- 150W ; it is the region wh ere SST evolution have the strongest relationship with evolution of convection over the equatorial Pacific.

- Niño 3.4 : 5°S/5°N 120W-170W ; it is a compromise between Niño 3 and Niño 4 boxes (SST variability and Rainfall impact).

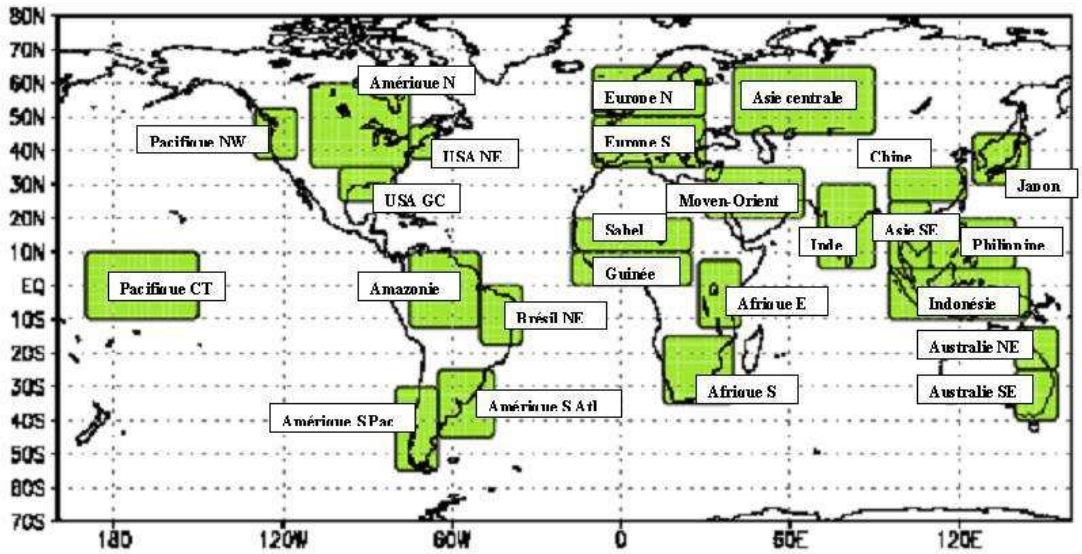
Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea level pressure at Tahiti minus standardized sea level pressure at Darwin (see above figure). It represents the Walker (zonal) circulation and its modifications. Its sign is opposite to the SST anomaly meaning that when the SST is warmer (respectively colder) than normal (Niño respectively Niña event), the zonal circulation is weakened (respectively strengthened).

Oceanic boxes used in this bulletin :



III.3. Land Boxes

Some forecasts correspond to box averaged values for some specific area over continental regions. These boxes are described in the following map and are common to ECMWF and Météo-France.



III.4. Acknowledgement

This bulletin is edited by the RCC-LRF Node of the RCC Network in Toulouse for the RA VI. It is a joint effort of the RCC-Climate Monitoring Node (led by DWD) and the RCC-LRF Node (Co-Led by Météo-France).